U.S. EPA METHOD 21
CALIBRATION - PRECISION TEST AND RESPONSE TIME

This instrument has been calibrated-precision tested according to U.S. EPA Test Method 21 at a minimum of 3-month intervals and as instruments are modified or put back into service. The calibration gases have been analyzed and certified by the manufacturer to be within + or - 2% accurate. A copy of this certification is attached to this certification form.

DATE AND TIME: _____

TECHNICIAN: _____

INSTRUMENT ID: _____

PROBE TYPE: _____

Calibration Gases

	Calibration Gas Standard	Cylinder ID #	Actual Concentration (ppm)	Expiration Date	Sample Bag Number	Bag Leaks Y/N
ZERO AIR	Air					
SPAN 1 GAS	Methane					
SPAN 2 GAS	Methane					
SPAN 3 GAS	Methane					

Calibration - Precision Test

	Run 1 (ppm)	Run 2 (ppm)	Run 3 (ppm)	Average Algebraic Difference[1]	Percent of Standard[2]
ZERO AIR					
SPAN 1 GAS					
SPAN 2 GAS					
SPAN 3 GAS					

Response Time Test

	90% of Calibration standard	Run 1 (sec)	Run 2 (sec)	Run 3 (sec)	Total Seconds	Average[3]
ZERO AIR						
SPAN 1 GAS						
SPAN 2 GAS						
SPAN 3 GAS						

Required Scan Time[4]	

Calibration - Precision Test Procedures

The calibration - precision Test shall be performed at minimum 3 month intervals or at next use. Make a total of three measurements by alternately using zero (air) gas and the specified calibration gas. Record the meter readings. The percent of standard shall be equal to or less than 10% of the calibration gas value. If it is greater than 10%, re-calibrate.

[1] $\text{Average Algebraic Difference} = \dfrac{(\,(Test1 - Actual\ Conc.) + (Test2 - Actual\ Conc.) + (Test3 - Actual\ Conc.)\,)}{3}$

[2] $\text{Percent of Standard} = \dfrac{\text{Average Algebraic Difference}}{\text{Actual Concentration}} * 100\%$

Response Time Procedures

The response time test is required before placing the instrument into service. If a modification to the sample pumping system or flow configuration is made that would change the response time then a new test is required. Introduce zero gas into the sample probe. When meter reading has stabilized, switch quickly to the calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading. Perform this test sequence three times and record the results. The average response time shall be equal to or less than 30 seconds. The probe that will be used during inspection including the probe filter must be in place during the testing.

[3] $\text{Average} = \dfrac{(Run\ 1 + Run\ 2 + Run\ 3)}{3}$

[4] $\text{Required Scan Time} = 2 * \text{Average Response Time}$

Response Time Test: Results are calculated by first calculating 90% of the calibration standard. This is the reading at which the instrument must respond within 30 seconds if it is to pass this part of the certification test. By inserting the calibration gas and measuring, in seconds, the amount of time it requires to reach this 90% figure.